Undergraduate Curriculum in Biology
Case Western Reserve University

Fall Courses

302: Human Learning and the Brain (o, DS)
310: Field Studies in Evolutionary Ecology (L)
326: Genetics (c/m)
336: Aquatic Biology (p/e)
339: Aquatic Biology Lab (L)
351: Principles of Ecology (p/e)
351L: Principles of Ecology Laboratory (L)
352: Ecology and Evolution of Infectious Diseases (QL) (Fall in Fall 2015 only)
364: Research Methods in Evolutionary Biology (p/e, DS) (odd)
384: Reading/Writing Like an Ecologist (p/e, DS)

301: Biotechnology Lab: Genes and Genetic Engineering (L)
311: Survey of Bioinformatics:
  311A: Technologies in Bioinformatics
  311B: Data Integration in Bioinformatics
  311C: Translational Bioinformatics
  311D: Programming for Bioinformatics
334: Structural Biology of Proteins, Enzymes, and Nucleic Acids (c/m)

305: Herpetology (L) (even)
318: Introductory Entomology (o - or - L)
321: Design and Analysis of Biological Experiments (QL)
333: The Human Microbiome (o, DS)
340: Human Physiology (o) (as available)
345: Mammalian Diversity and Evolution (L) (odd)
346: Human Anatomy (o)
353: Ecophysiology of Global Change (L)
362: Principles of Developmental Biology (o)
363: Experimental Developmental Biology (L) (on hiatus)
373: Introduction to Neurobiology (o - or - QL as of Fall 2014; o previous versions)
374: Neurobiology of Behavior (o, DS)
376: Neurobiology Laboratory (L) (on hiatus)

*306: Dynamics of Biological Systems II

*114: Principles of Biology
*116: Introduction to Anatomy and Physiology I

* Indicates courses that do not count towards any Biology degree
* Indicates courses for the B.S. in Systems Biology

Spring Courses

*117: Introduction to Anatomy and Physiology II
225: Evolution (p/e)
*240: Personalized Medicine (odd) (on hiatus)
307: Evolutionary Biology of the Invertebrates (p/e) (odd)

323: Vertebrate Biology (L)
302: Human Learning and the Brain (o, DS)
326: Genetics (c/m)
332: Ecology and Evolution of Infectious Diseases (QL)
397: Molecular Phylogenetics (QL)

301: Biotechnology Lab: Genes and Genetic Engineering (L) (as available)
308: Molecular Biology: Genes and Genetic Engineering (c/m)
311A/B/C/D: Survey of Bioinformatics (see Fall list for details)
316: Fundamental Immunology (c/m)
325: Cell Biology (c/m)
327: Functional Genomics (QL)
328: Plant Genomics and Proteomics (c/m) (even) (on hiatus)
343: Microbiology (c/m)
344: Laboratory for Microbiology (L)

315: Quantitative Biology Laboratory (QL)
322: Sensory Biology (o)
324: Introduction to Stem Cell Biology (c/m)
338: Ichthyology (o - or - L)
340: Human Physiology (o)
342: Parasitology (c/m)
346: Human Anatomy (o) (as available)
357: Backyard Behavior (CAP)
358: Animal Behavior (p/e - or - L)
365: Evo-Devo: Evolution of Body Plans (c/m, DS)
368: Topics in Evolutionary Biology (p/e)

*300: Dynamics of Biological Systems I (QL)
*304: Fitting Models to Data: Maximum Likelihood Methods and Model Selection (QL)
*319: Biological Stochastic Processes (on hiatus)
377: Biorobotics Team Research (L, CAP)
*378: Computational Neuroscience

Summer Courses

*114: Principles of Biology
302: Human Learning and the Brain (o, DS)
336: Aquatic Biology (p/e)
338: Ichthyology (o - or - L)
339: Aquatic Biology Lab (L)
343: Microbiology (c/m)

308: Molecular Biology: Genes and Genetic Engineering (c/m)
328: Plant Genomics and Proteomics (c/m) (even) (on hiatus)
332: Ecology and Evolution of Infectious Diseases (QL)
344: Laboratory for Microbiology (L)

*306: Dynamics of Biological Systems II

BREADTH, LABS, and SAGES

| c/m | cell and molecular |
| o  | population and ecology |
| L  | laboratory |
| QL | quantitative laboratory |
| DS | SAGES Departmental Seminar |
| CAP | SAGES Senior Capstone |

UNDERGRADUATE SEMINARS

369: Evolutionary Biology Capstone (CAP)
385: Seminar on Biological Processes in Learning and Cognition (o, CAP) (on hiatus)
394: Seminar in Evolutionary Biology (p/e)

UNDERGRADUATE RESEARCH

388: Undergraduate Research in Biology
388S: Undergraduate Research (CAP)
389: Selected Topics in Biology
389S: Selected Topics in Biology (CAP)
390: Advanced Undergraduate Research
396: Research in Evolutionary Biology

Schedule and courses offered are subject to change without notice!

Department Contact: Ms. Katie Bingman, krb28@case.edu, (216) 368-4301
Department Webpage: http://biology.case.edu/
University Bulletin: http://bulletin.case.edu/collegeofartsandsciences/biology/
SUMMARY OF BIOLOGY COURSE/DEGREE REQUIREMENTS

**Biology Major (B.A.)**
Core sequence (214, 215, and 216) and labs (214L, 215L, and 216L) .................. 12 hr
*Courses in two of these three areas: .................................................. typically 6 hr
  Cell and molecular biology
  Organismal biology
  Population biology/ecology
‡ Genetics (326) .............................................................................. 3 hr
* Two laboratory courses ................................................................. 4–8 hr
* Electives (any BIOL at the 200 level or higher, except 240, 250, or 251) .............. typically 3–6 hr
(Additional math, chemistry, and physics — 32 hr)

**B.S. in Biology**
Core sequence lectures (214, 215, 216) and labs (214L, 215L, 216L) ......................... 12 hr
** Courses in two of these three areas: .............................................. typically 6 hr
  Cell and molecular biology
  Organismal biology
  Population biology/ecology
‡‡ Genetics (326) ............................................................................ 3 hr
One quantitative biology laboratory (300, 304, 315, 321, 327, 352, §373, or 397) ........ 3–4 hr
** One additional laboratory course ............................................. 2–4 hr
** Electives (any BIOL at the 200 level or higher, except 240, 250, or 251) ............... typically 3–6 hr
Undergraduate research (388S and 390) .............................................. 6 hr
(Additional math, chemistry, physics, and computer programming — 41 hr)

**B.S. in Systems Biology**
Core sequence (‡214, ‡215, ‡216, 300, and 306) ............................................. 12 hr
*** Approved subspecialty sequence (two courses in any one of the following areas). ........ 6 hr
  Neuroscience (373, 374, 376, 378)
  Bioinformatics and Genetics (301, 308, 326, 328, 359, EECS 358, EECS 459)
  Ecology and Evolutionary Biology (305, 307, 336, 345, 351, 358, 364, 368)
  Cellular and Molecular Biology (308, 316, 324, 325, 334, 342, 343, 362, 363, 365)
Biology electives (any BIOL at the 200 level or higher, except 214, 215, 216, or 240) .......... 12 hr
(Undergraduate research strongly recommended — 388S and 390)
(Any two of six non-BIOL courses in systems, informatics, and signals — 6 hr)
(Additional math, chemistry, physics, computer programming, computer science, and statistics — 42 hr)

**Total** 30 hr

**Biology Minor**
Core sequence: any two of BIOL 214+L, 215+L, 216+L, OR both BIOL 250 and 251 .......... 6–8 hr
Any BIOL at the 200 level or higher, except 240 or the opposite core sequence .................. 8–10 hr

**Total** 16 hr

‡ Required for the Fall 2014 entering class and after; serves as a cell/molecular elective for earlier entering classes.
‡‡ Effective for the Fall 2014 entering class and after, BIOL 301 cannot substitute for the genetic requirement.
* Altogether, at least 12 hr of these courses must be at the 300 level or higher; minimum 15 hr required.
** Altogether, at least 11 hr of these courses must be at the 300 level or higher; minimum 17 hr required.
*** Additional courses for each subspecialty sequence are currently under review.
§ Only if taken Fall 2014 and after; earlier versions serve as an organismal elective.
◇ These courses replace BIOL 250 and BIOL 251 (both discontinued), effective for the Fall 2015 entering class and after. Current SYB-BS students who have not already completed both courses will be handled on a case-by-case basis. In general, the substitutions are BIOL 215 for BIOL 250, and either BIOL 214 or BIOL 216 for BIOL 251.

(Rev. 02/10/2015)
Breadth Requirement: Major Areas in Biology

Students in the B.A. and B.S. Biology degree programs must take at least one of the following 3-credit or 4-credit courses from two of the following three major areas. This insures broad exposure to different fields in Biology. The Breadth Requirement does not apply to the Systems Biology B.S. degree program.

Note: Only courses listed here may be used to satisfy the Breadth Requirement. Non-listed courses may count as Biology electives, depending upon degree program. No 100-level course may be used in any Biology degree program. BIOL 390 does not count towards the 30 hours of BIOL needed for the B.A. Biology degree.

### Cell and Molecular Biology (c/m)
- 308: Molecular Biology: Genes and Genetic Engineering (4)
- 316: Fundamental Immunology (4)
- 324: Introduction to Stem Cell Biology (3)
- 325: Cell Biology (3)
- 326: Genetics (only for entering classes before Fall 2014) (3)
- 328: Plant Genomics and Proteomics (even years only) (3)
- 334: Structural Biology of Proteins, Enzymes and Nucleic Acids (3)
- 342: Parasitology (3)
- 343: Microbiology (3)
- 345: Mammalian Diversity and Evolution (lab) (odd years only) (4)
- 351L: Principles of Ecology Laboratory (lab) (2)
- 353: Ecophysiology of Global Change (lab) (4)
- 363: Experimental Developmental Biology (lab) (on hiatus) (3)
- 373: Introduction to Neurobiology (quant lab or organismal breadth) (effective Fall 2014) (3)

### Organismal Biology (o)
- 302: Human Learning and the Brain (breadth and SAGES DS) (3)
- 318: Introductory Entomology (breadth or lab) (4)
- 322: Sensory Biology (3)
- 333: The Human Microbiome (breadth and SAGES DS) (3)
- 340: Human Physiology (3)
- 349: Ichthyology (effective Spring 2015, breadth or lab) (3)
- 350: Human Anatomy (3)
- 353: Ecophysiology of Global Change (lab) (4)
- 367: Biorobotics Team Research (lab and SAGES Capstone) (3)

### Population Biology/Ecology (p/e)
- 225: Evolutionary Biology of the Invertebrates (odd years only) (3)
- 307: Evolutionary Biology of the Invertebrates (odd years only) (3)
- 308: Animal Behavior (breadth or lab) (4)
- 364: Research Methods in Evolutionary Biology (breadth and SAGES DS) (odd years only) (3)
- 368: Topics in Evolutionary Biology (3)

### Laboratory Classes

Numbers in parentheses indicate the number of credit hours. Note: Some courses may count as either a breadth requirement or a laboratory (but not both). BIOL 346, 388, 388S, and 390 do not count as laboratories.

<table>
<thead>
<tr>
<th>Fall</th>
<th>Spring</th>
<th>Summer</th>
</tr>
</thead>
<tbody>
<tr>
<td>301: Biotechnology Laboratory (lab) (3)</td>
<td>223: Vertebrate Biology (lab) (3)</td>
<td>338: Ichthyology (effective Spring 2015, lab or organismal breadth) (4)</td>
</tr>
<tr>
<td>305: Herpetology (lab) (even years only) (4)</td>
<td>300: Dynamics of Biological Systems I (quant lab) (3)</td>
<td>339: Aquatic Biology Laboratory (lab) (2)</td>
</tr>
<tr>
<td>310: Field Studies in Evolutionary Ecology (lab) (3)</td>
<td>301: Biotechnology Laboratory (lab) (as available) (3)</td>
<td></td>
</tr>
<tr>
<td>318: Introductory Entomology (lab or organismal breadth) (4)</td>
<td>304: Fitting Models to Data: Maximum Likelihood Methods and Model Selection (quant lab) (3)</td>
<td></td>
</tr>
<tr>
<td>321: Design and Analysis of Biological Experiments (quant lab) (3)</td>
<td>315: Quantitative Biology Laboratory (quant lab) (3)</td>
<td></td>
</tr>
<tr>
<td>339: Aquatic Biology Laboratory (lab) (2)</td>
<td>327: Functional Genomics (quant lab) (3)</td>
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</tr>
<tr>
<td>345: Mammalian Diversity and Evolution (lab) (odd years only) (4)</td>
<td>338: Ichthyology (lab or organismal breadth) (effective Spring 2015) (4)</td>
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</tr>
<tr>
<td>351L: Principles of Ecology Laboratory (lab) (2)</td>
<td>344: Microbiology Laboratory (lab) (3 effective Spring 2016, 2 previously)</td>
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<tr>
<td>352: Ecology and Evolution of Infectious Diseases (quant lab) (3) (special repeat Fall 2015 only)</td>
<td>352: Ecology and Evolution of Infectious Diseases (quant lab) (3)</td>
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<tr>
<td>353: Ecophysiology of Global Change (lab) (4)</td>
<td>358: Animal Behavior (lab or organismal breadth) (4)</td>
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</tr>
<tr>
<td>363: Experimental Developmental Biology (lab) (on hiatus) (3)</td>
<td>377: Biorobotics Team Research (lab and SAGES Capstone) (3)</td>
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</tr>
<tr>
<td>373: Introduction to Neurobiology (quant lab or organismal breadth) (effective Fall 2014) (3)</td>
<td>397: Molecular Phylogenetics (quant lab) (4)</td>
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</tbody>
</table>

(Rev. 03/22/2015)
BACHELOR OF ARTS DEGREE IN BIOLOGY  
SUGGESTED SEQUENCE OF COURSES — FALL START (recommended)  
(effective Fall 2011 entering class)

**Freshman Year**

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<thead>
<tr>
<th>FALL</th>
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<tbody>
<tr>
<td>SAGES First Year Seminar (4)</td>
<td>SAGES University Seminar (3)</td>
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<tr>
<td>MATH 125 Mathematics I (4)</td>
<td>MATH 126 Mathematics II (4)</td>
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<tr>
<td>CHEM 105 Principles of Chemistry I (3)</td>
<td>CHEM 106 Principles of Chemistry II (3)</td>
</tr>
<tr>
<td>BIOL 214 + BIOL 214L Genes, Evolution and Ecology (3 + 1)</td>
<td>CHEM 113 Principles of Chemistry Laboratory (2)</td>
</tr>
<tr>
<td>PHED ### Physical Education Activities (0)</td>
<td>BIOL 215 + BIOL 215L Cells and Proteins (3 + 1)</td>
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<tr>
<td>PHED ### Physical Education Activities (0)</td>
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**Sophomore Year**

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>BIOL 216 + BIOL 216L Development and Physiology (3 + 1)</td>
<td>BIOL Elective (3)</td>
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<tr>
<td>CHEM 223 Introductory Organic Chemistry I (3)</td>
<td>CHEM 224 Introductory Organic Chemistry II (3)</td>
</tr>
<tr>
<td>CHEM 233 Organic Chemistry Laboratory I (2)</td>
<td>SAGES Departmental Seminar (3)</td>
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<tr>
<td>SAGES University Seminar (3)</td>
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<td>GER Course (3)</td>
<td>Open Elective (3)</td>
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**Junior Year**

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<thead>
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<tr>
<td>BIOL Elective (3)</td>
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<tr>
<td>BIOL Laboratory (2–4)</td>
<td>BIOL Laboratory (2–4)</td>
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<tr>
<td>PHYS 115 Introductory Physics I (4)</td>
<td>PHYS 116 Introductory Physics II (4)</td>
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<tr>
<td>GER Course (3)</td>
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<tr>
<td>Open Elective (3)</td>
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**Senior Year**

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<tr>
<td>BIOL Elective (3)</td>
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(Rev. 03/17/2014)
BACHELOR OF ARTS DEGREE IN BIOLOGY
SUGGESTED SEQUENCE OF COURSES — FALL START (recommended)
(effective Fall 2014 entering class)

**Freshman Year**

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<thead>
<tr>
<th><strong>FALL</strong></th>
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<tr>
<td>SAGES First Year Seminar (4)</td>
<td>SAGES University Seminar (3)</td>
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<tr>
<td>MATH 125 Mathematics I (4)</td>
<td>MATH 126 Mathematics II (4)</td>
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<tr>
<td>CHEM 105 Principles of Chemistry I (3)</td>
<td>CHEM 106 Principles of Chemistry II (3)</td>
</tr>
<tr>
<td>BIOL 214 + BIOL 214L Genes, Evolution and Ecology (3 + 1)</td>
<td>CHEM 113 Principles of Chemistry Laboratory (2)</td>
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<tr>
<td>PHED ### Physical Education Activities (0)</td>
<td>BIOL 215 + BIOL 215L Cells and Proteins (3 + 1)</td>
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<td>PHED ### Physical Education Activities (0)</td>
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**Sophomore Year**

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<td>BIOL Elective (3) OR BIOL 326 Genetics (3)</td>
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<tr>
<td>CHEM 223 Introductory Organic Chemistry I (3)</td>
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<td>SAGES Departmental Seminar (3)</td>
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**Junior Year**

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**Senior Year**

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(Rev. 03/17/2014)
# BACHELOR OF ARTS DEGREE IN BIOLOGY

**SUGGESTED SEQUENCE OF COURSES — SPRING START** (trailer)  
(effective Fall 2014 entering class; earlier classes similar)

## Freshman Year

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<tr>
<td>SAGES First Year Seminar (4)</td>
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<td>MATH 125 Mathematics I (4)</td>
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<td>CHEM 105 Principles of Chemistry I (3)</td>
<td>CHEM 106 Principles of Chemistry II (3)</td>
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<tr>
<td>CHEM 113 Principles of Chemistry Laboratory (2)</td>
<td>BIOL 214 + BIOL 214L Genes, Evolution, and Ecology (3 + 1)</td>
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<tr>
<td>PHED ### Physical Education Activities (0)</td>
<td>PHED ### Physical Education Activities (0)</td>
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<td>BIOL 215 + BIOL 215L Cells and Proteins (3 + 1)</td>
<td>BIOL 216 + BIOL 216L Development and Physiology (3 + 1)</td>
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<td>CHEM 223 Introductory Organic Chemistry I (3)</td>
<td>BIOL Elective (3)</td>
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<td>CHEM 233 Organic Chemistry Laboratory I (2)</td>
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## Junior Year

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<td>BIOL Elective (3)  OR BIOL 326 Genetics (3)</td>
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<td>GER Course (3)</td>
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## Senior Year

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<td>BIOL Elective (3)  OR SAGES Capstone (3)</td>
<td>SAGES Capstone (3)  OR BIOL Elective (3)</td>
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(Rev. 03/17/2014)
BACHELOR OF SCIENCE DEGREE IN BIOLOGY
SUGGESTED SEQUENCE OF COURSES — FALL START (recommended)
(effective Fall 2011 entering class)

**Freshman Year**

<table>
<thead>
<tr>
<th>FALL</th>
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<tr>
<td>SAGES First Year Seminar (4)</td>
<td>SAGES University Seminar (3)</td>
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<tr>
<td>MATH 125 Mathematics I (4)</td>
<td>MATH 126 Mathematics II (4)</td>
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<td>CHEM 105 Principles of Chemistry I (3)</td>
<td>CHEM 106 Principles of Chemistry II (3)</td>
</tr>
<tr>
<td>BIOL 214 + BIOL 214L Genes, Evolution and Ecology (3 + 1)</td>
<td>CHEM 113 Principles of Chemistry Laboratory (2)</td>
</tr>
<tr>
<td>PHED ### Physical Education Activities (0)</td>
<td>BIOL 215 + BIOL 215L Cells and Proteins (3 + 1)</td>
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**Sophomore Year**

<table>
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<tr>
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<tbody>
<tr>
<td>BIOL 216 + BIOL 216L Development and Physiology (3 + 1)</td>
<td>Genetics Course (3) — Select from BIOL 301 or 326</td>
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<tr>
<td>CHEM 223 (or 323) Introductory Organic Chemistry I (3)</td>
<td>CHEM 224 (or 324) Introductory Organic Chemistry II (3)</td>
</tr>
<tr>
<td>CHEM 233 Organic Chemistry Laboratory I (2)</td>
<td>ENGR 131 Elementary Computer Programming (3)</td>
</tr>
<tr>
<td>SAGES University Seminar (3)</td>
<td>Open Elective (3)</td>
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<tr>
<td>GER Course (3)</td>
<td>GER Course (3)</td>
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</tbody>
</table>

**Junior Year**

<table>
<thead>
<tr>
<th>FALL</th>
<th>SPRING</th>
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<tbody>
<tr>
<td>BIOL Elective (3) OR</td>
<td>Quantitative Biology Laboratory Course (3–4) — Select from BIOL 300, 304, 315, 321, 327, 352, §373, or 397</td>
</tr>
<tr>
<td>BIOL Laboratory (2–4)</td>
<td>SAGES Departmental Seminar (3)</td>
</tr>
<tr>
<td>Advanced Mathematics or Statistics Course (3) — Select from MATH 201 or 304; or BIOL 431; or STAT 207, 312, or 313</td>
<td>PHYS 115 Introductory Physics I (4)</td>
</tr>
<tr>
<td>PHY 115 Introductory Physics I (4)</td>
<td>BIOL Elective (3)</td>
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<td>BIOL Elective (3)</td>
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<tr>
<td>GER Course (3)</td>
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</table>

§Only if taken Fall 2014 and after.

**Senior Year**

<table>
<thead>
<tr>
<th>FALL</th>
<th>SPRING</th>
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<tbody>
<tr>
<td>BIOL 388S Undergraduate Research — SAGES Capstone (3)</td>
<td>BIOL 390 Advanced Undergraduate Research (3)</td>
</tr>
<tr>
<td>CHEM 301 Introductory Physical Chemistry (3)</td>
<td>BIOL Elective (3)</td>
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<tr>
<td>BIOL Elective (3)</td>
<td>BIOL Elective (3) if needed OR Open Elective (3)</td>
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<tr>
<td>BIOL Laboratory (2–4) if needed OR Open Elective (3)</td>
<td>Open Elective (3)</td>
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</table>

(Rev. 02/10/2015)
BACHELOR OF SCIENCE DEGREE IN BIOLOGY
SUGGESTED SEQUENCE OF COURSES — FALL START (recommended)
(effective Fall 2014 entering class)

*Freshman Year*

<table>
<thead>
<tr>
<th>FALL</th>
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<tbody>
<tr>
<td>SAGES First Year Seminar (4)</td>
<td>SAGES University Seminar (3)</td>
</tr>
<tr>
<td>MATH 125 Mathematics I (4)</td>
<td>MATH 126 Mathematics II (4)</td>
</tr>
<tr>
<td>CHEM 105 Principles of Chemistry I (3)</td>
<td>CHEM 106 Principles of Chemistry II (3)</td>
</tr>
<tr>
<td>BIOL 214 + BIOL 214L Genes, Evolution and Ecology (3 + 1)</td>
<td>CHEM 113 Principles of Chemistry Laboratory (2)</td>
</tr>
<tr>
<td>PHED ### Physical Education Activities (0)</td>
<td>BIOL 215 + BIOL 215L Cells and Proteins (3 + 1)</td>
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*Sophomore Year*

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>BIOL 216 + BIOL 216L Development and Physiology (3 + 1)</td>
<td>BIOL 326 Genetics (3)</td>
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<tr>
<td>CHEM 223 (or 323) Introductory Organic Chemistry I (3)</td>
<td>CHEM 224 (or 324) Introductory Organic Chemistry II (3)</td>
</tr>
<tr>
<td>CHEM 233 Organic Chemistry Laboratory I (2)</td>
<td>ENGR 131 Elementary Computer Programming (3)</td>
</tr>
<tr>
<td>SAGES University Seminar (3)</td>
<td>Open Elective (3)</td>
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<table>
<thead>
<tr>
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<tr>
<td>BIOL Elective (3) OR</td>
<td>Quantitative Biology Laboratory Course (3–4) – Select</td>
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<td>BIOL Laboratory (2–4)</td>
<td>from BIOL 300, 304, 315, 321, 327, 352, §373, or 397</td>
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<tr>
<td>Advanced Mathematics or Statistics Course (3) — Select from MATH 201 or 304; or BIOL 431; or STAT 207, 312, or 313</td>
<td>SAGES Departmental Seminar (3)</td>
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<tr>
<td>PHYS 115 Introductory Physics I (4)</td>
<td>PHYS 116 Introductory Physics II (4)</td>
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<tr>
<td>BIOL 388S Undergraduate Research — SAGES Capstone (3)</td>
<td>BIOL 390 Advanced Undergraduate Research (3)</td>
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<td>CHEM 301 Introductory Physical Chemistry (3)</td>
<td>BIOL Elective (3)</td>
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<td>BIOL Laboratory (2–4) if needed OR</td>
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(Rev. 02/10/2015)
### Bachelor of Science Degree in Biology

**Suggested Sequence of Courses — Spring Start (trailer)**
*(effective Fall 2014 entering class; earlier classes similar)*

#### Freshman Year

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<tr>
<th><strong>FALL</strong></th>
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<tr>
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<td>SAGES University Seminar (3)</td>
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<tr>
<td>MATH 125 Mathematics I (4)</td>
<td>MATH 126 Mathematics II (4)</td>
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<tr>
<td>CHEM 105 Principles of Chemistry I (3)</td>
<td>CHEM 106 Principles of Chemistry II (3)</td>
</tr>
<tr>
<td>CHEM 113 Principles of Chemistry Laboratory (2)</td>
<td>BIOL 214 + BIOL 214L Genes, Evolution, and Ecology (3 + 1)</td>
</tr>
<tr>
<td>PHED ### Physical Education Activities (0)</td>
<td>PHED ### Physical Education Activities (0)</td>
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<tr>
<td>GER Course (3)</td>
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#### Sophomore Year

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<thead>
<tr>
<th><strong>FALL</strong></th>
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<tbody>
<tr>
<td>BIOL 215 + BIOL 215L Cells and Proteins (3 + 1)</td>
<td>BIOL 216 + BIOL 216L Development and Physiology (3 + 1)</td>
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<tr>
<td>CHEM 223 (or 323) Introductory Organic Chemistry I (3)</td>
<td>CHEM 224 (or 324) Introductory Organic Chemistry II (3)</td>
</tr>
<tr>
<td>CHEM 233 Organic Chemistry Laboratory I (2)</td>
<td>ENGR 131 Elementary Computer Programming (3)</td>
</tr>
<tr>
<td>SAGES University Seminar (3)</td>
<td>Open Elective (3)</td>
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#### Junior Year

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<tbody>
<tr>
<td>BIOL 326 Genetics (3)</td>
<td>Quantitative Biology Laboratory Course (3–4) – Select from BIOL 300, 304, 315, 321, 327, 352, §373, or 397</td>
</tr>
<tr>
<td>Advanced Mathematics or Statistics Course (3) — Select from MATH 201 or 304; or BIOL 431; or STAT 207, 312, or 313</td>
<td>SAGES Departmental Seminar (3)</td>
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<tr>
<td>PHYS 115 Introductory Physics I (4)</td>
<td>PHYS 116 Introductory Physics II (4)</td>
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<tr>
<td>BIOL Elective (3)</td>
<td>BIOL Elective (3)</td>
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#### Senior Year

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<tbody>
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<td>BIOL 388S Undergraduate Research — SAGES Capstone (3)</td>
<td>BIOL 390 Advanced Undergraduate Research (3)</td>
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<td>CHEM 301 Introductory Physical Chemistry (3)</td>
<td>BIOL Elective (3–4)</td>
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<td>BIOL Elective (3) if needed OR Open Elective (3)</td>
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<td>BIOL Laboratory (2–4) if needed OR Open Elective (3)</td>
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(Rev. 02/10/2015)
# Bachelor of Science in Systems Biology

**Suggested Sequence of Courses** (non-prehealth students)

*(all classes entering before Fall 2015)*

## Freshman Year

<table>
<thead>
<tr>
<th>FALL</th>
<th>SPRING</th>
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</thead>
<tbody>
<tr>
<td>SAGES First Year Seminar (4)</td>
<td>✧BIOL 250 Introduction to Cell and Molecular Biology Systems (3)</td>
</tr>
<tr>
<td>MATH 121 Calculus for Science and Engineering I (4)</td>
<td>MATH 122 Calculus for Science and Engineering II (4)</td>
</tr>
<tr>
<td>CHEM 105 Principles of Chemistry I (3)</td>
<td>CHEM 106 Principles of Chemistry II (3)</td>
</tr>
<tr>
<td>CHEM 113 Principles of Chemistry Laboratory (2)</td>
<td>Open Elective (3)</td>
</tr>
<tr>
<td>Open Elective (3)</td>
<td>SAGES University Seminar (3)</td>
</tr>
<tr>
<td>PHED ### Physical Education Activities (0)</td>
<td>PHED ### Physical Education Activities (0)</td>
</tr>
</tbody>
</table>
# BACHELOR OF SCIENCE IN SYSTEMS BIOLOGY

## SUGGESTED SEQUENCE OF COURSES (prehealth students)

*(all classes entering before Fall 2015)*

### Freshman Year

<table>
<thead>
<tr>
<th>FALL</th>
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</tr>
</thead>
<tbody>
<tr>
<td>SAGES First Year Seminar (4)</td>
<td>✧BIOL 250 Introduction to Cell and Molecular Biology Systems (3)</td>
</tr>
<tr>
<td>MATH 121 Calculus for Science and Engineering I (4)</td>
<td>MATH 122 Calculus for Science and Engineering II (4)</td>
</tr>
<tr>
<td>CHEM 105 Principles of Chemistry I (3)</td>
<td>CHEM 106 Principles of Chemistry II (3)</td>
</tr>
<tr>
<td>CHEM 113 Principles of Chemistry Laboratory (2)</td>
<td>GER Course (3)</td>
</tr>
<tr>
<td>Open Elective (3)</td>
<td>SAGES University Seminar (3)</td>
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<td>PHED ### Physical Education Activities (0)</td>
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### Sophomore Year

<table>
<thead>
<tr>
<th>FALL</th>
<th>SPRING</th>
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<tbody>
<tr>
<td>✧BIOL 251 Introduction to Organismal and Population Biology Systems (3)</td>
<td>BIOL 300 Dynamics of Biological Systems I (3)</td>
</tr>
<tr>
<td>BIOL 216L Physiology and Development Laboratory (1)</td>
<td>BIOL 215L Cells and Proteins Laboratory (1)</td>
</tr>
<tr>
<td>CHEM 223 Introductory Organic Chemistry I (3)</td>
<td>CHEM 224 Introductory Organic Chemistry II (3)</td>
</tr>
<tr>
<td>CHEM 233 Introductory Organic Chemistry Laboratory I (2)</td>
<td>MATH 224 Elementary Differential Equations (3)</td>
</tr>
<tr>
<td>MATH 223 Calculus for Science and Engineering III (3)</td>
<td>EECS 132 Elementary Programming in Java (3)</td>
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<tr>
<td>SAGES University Seminar (3)</td>
<td>GER Course (3)</td>
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### Junior Year

<table>
<thead>
<tr>
<th>FALL</th>
<th>SPRING</th>
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<tbody>
<tr>
<td>BIOL 306 Dynamics of Biological Systems II (3)</td>
<td>STAT 312 Basic Statistics for Engineering and Science (3)</td>
</tr>
<tr>
<td>PHYS 121 General Physics I (4)</td>
<td>PHYS 122 General Physics II (4)</td>
</tr>
<tr>
<td>EECS 302/MATH 304 Discrete Mathematics (3)</td>
<td>EECS 233 Introduction to Data Structures (3)</td>
</tr>
<tr>
<td>BIOC 307 General Biochemistry (4)</td>
<td>SAGES Departmental Seminar (3)</td>
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<tr>
<td>GER Course (3)</td>
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### Senior Year

<table>
<thead>
<tr>
<th>FALL</th>
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<tbody>
<tr>
<td>SAGES Capstone (3) <em>(recommended BIOL 388S Undergraduate Research — SAGES Capstone)</em></td>
<td>BIOL Elective (3) <em>(recommended BIOL 390 Advanced Undergraduate Research)</em></td>
</tr>
<tr>
<td>BIOL Subspecialty Elective (3)</td>
<td>BIOL Subspecialty Elective (3)</td>
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<tr>
<td>Systems Elective (3)</td>
<td>Systems Elective (3)</td>
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<tr>
<td>Open Elective (3)</td>
<td>BIOL Elective (3)</td>
</tr>
<tr>
<td>BIOL Elective (3)</td>
<td>BIOL Elective (3) if needed OR Open Elective (3)</td>
</tr>
</tbody>
</table>

✧These courses were discontinued effective Spring 2015.

See note on page 2 for substitution information.  
(Rev. 02/10/2015)
# Bachelor of Science in Systems Biology

**Suggested Sequence of Courses** (non-prehealth students)
(effective Fall 2015 entering class)

## Freshman Year

<table>
<thead>
<tr>
<th>FALL</th>
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</tr>
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<tbody>
<tr>
<td><strong>BIOL 214 Genes, Evolution, and Ecology (3)</strong></td>
<td><strong>BIOL 215 Cells and Proteins (3)</strong></td>
</tr>
<tr>
<td><strong>MATH 121 Calculus for Science and Engineering I (4)</strong></td>
<td><strong>MATH 122 Calculus for Science and Engineering II (4)</strong></td>
</tr>
<tr>
<td><strong>CHEM 105 Principles of Chemistry I (3)</strong></td>
<td><strong>CHEM 106 Principles of Chemistry II (3)</strong></td>
</tr>
<tr>
<td><strong>CHEM 113 Principles of Chemistry Laboratory (2)</strong></td>
<td><strong>Open Elective (3)</strong></td>
</tr>
<tr>
<td><strong>SAGES First Year Seminar (4)</strong></td>
<td><strong>SAGES University Seminar (3)</strong></td>
</tr>
<tr>
<td><strong>PHED ### Physical Education Activities (0)</strong></td>
<td><strong>PHED ### Physical Education Activities (0)</strong></td>
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## Sophomore Year

<table>
<thead>
<tr>
<th>FALL</th>
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<tbody>
<tr>
<td><strong>BIOL 216 Physiology and Development (3)</strong></td>
<td><strong>BIOL 300 Dynamics of Biological Systems I (3)</strong></td>
</tr>
<tr>
<td><strong>PHYS 121 General Physics I (4) OR §EECS 132 Elementary Programming in Java (3)</strong></td>
<td><strong>PHYS 122 General Physics II (4) OR §PHYS 121 General Physics I (4)</strong></td>
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<tr>
<td><strong>MATH 223 Calculus for Science and Engineering III (3)</strong></td>
<td><strong>MATH 224 Elementary Differential Equations (3)</strong></td>
</tr>
<tr>
<td><strong>SAGES University Seminar (3)</strong></td>
<td><strong>Open Elective (3)</strong></td>
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<td><strong>GER Course (3)</strong></td>
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</table>

§Recommended order for computer science-oriented students.

## Junior Year

<table>
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<tr>
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<tbody>
<tr>
<td><strong>BIOL 306 Dynamics of Biological Systems II (3)</strong></td>
<td><strong>STAT 312 Basic Statistics for Engineering and Science (3)</strong></td>
</tr>
<tr>
<td><strong>EECS 302/MATH 304 Discrete Mathematics (3)</strong></td>
<td><strong>EECS 233 Introduction to Data Structures (3)</strong></td>
</tr>
<tr>
<td><strong>EECS 132 Elementary Programming in Java (3) OR §PHYS 122 General Physics II (4)</strong></td>
<td><strong>BIOL Elective (3)</strong></td>
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<td><strong>BIOL Elective (3)</strong></td>
<td><strong>SAGES Departmental Seminar (3)</strong></td>
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§Recommended order for computer science-oriented students.

## Senior Year

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<tbody>
<tr>
<td><strong>SAGES Capstone (3) (recommended BIOL 388S Undergraduate Research — SAGES Capstone)</strong></td>
<td><strong>BIOL Elective (3) (recommended BIOL 390 Advanced Undergraduate Research)</strong></td>
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<tr>
<td><strong>BIOL Subspecialty Elective (3)</strong></td>
<td><strong>BIOL Subspecialty Elective (3)</strong></td>
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<tr>
<td><strong>Systems Elective (3)</strong></td>
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(Rev. 02/13/2015)
BACHELOR OF SCIENCE IN SYSTEMS BIOLOGY
SUGGESTED SEQUENCE OF COURSES (prehealth students)
(effective Fall 2015 entering class)

**Freshman Year**

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<tr>
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<tbody>
<tr>
<td>BIOL 214 Genes, Evolution, and Ecology (3)</td>
<td>BIOL 215 Cells and Proteins (3)</td>
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<td>MATH 121 Calculus for Science and Engineering I (4)</td>
<td>MATH 122 Calculus for Science and Engineering II (4)</td>
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<td>CHEM 105 Principles of Chemistry I (3)</td>
<td>CHEM 106 Principles of Chemistry II (3)</td>
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<td>CHEM 113 Principles of Chemistry Laboratory (2)</td>
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<td>SAGES First Year Seminar (4)</td>
<td>SAGES University Seminar (3)</td>
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<td>PHED ### Physical Education Activities (0)</td>
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<tr>
<td>BIOL 216 Physiology and Development (3)</td>
<td>BIOL 300 Dynamics of Biological Systems I (3)</td>
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<td>BIOL 215L Cells and Proteins Laboratory (1)</td>
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<td>CHEM 223 Introductory Organic Chemistry I (3)</td>
<td>CHEM 224 Introductory Organic Chemistry II (3)</td>
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<tr>
<td>CHEM 233 Introductory Organic Chemistry Laboratory I (2)</td>
<td>MATH 224 Elementary Differential Equations (3)</td>
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<td>EECS 132 Elementary Programming in Java (3)</td>
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<td>BIOL 306 Dynamics of Biological Systems II (3)</td>
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